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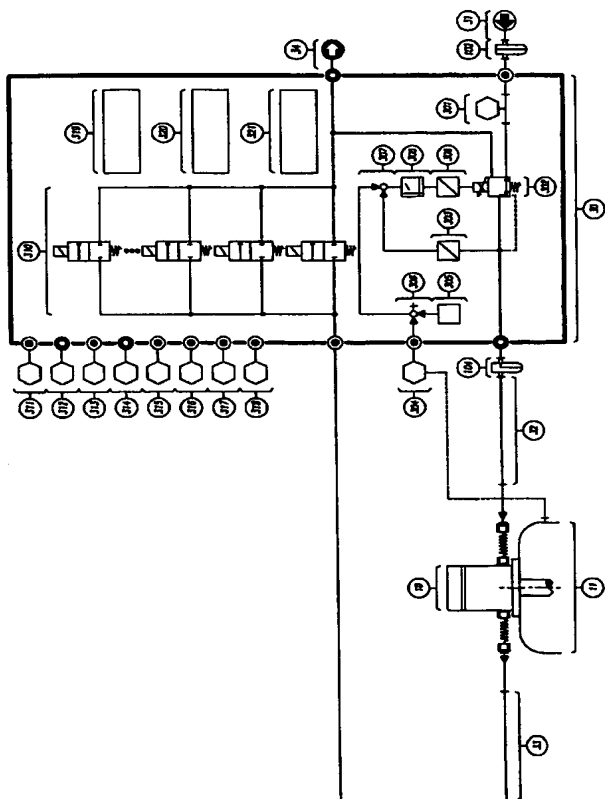
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[Continued on next page]

(54) Title: MULTIFUNCTIONAL ELECTRONIC DEVICE FOR A MECHANICAL SEAL AND CONTROL AND MANAGEMENT PROCESS REALISED BY SUCH DEVICE



(57) Abstract: Multifunctional electronic device (30) based on a microprocessor for checking and managing all operating and diagnostic conditions of a mechanical seal (10, 20). A mechanical seal, installed on pumps or process machines (11, 21), comprises two coupled surfaces, one rotating and integral with a shaft and one stationary and integral with the machine in which the shaft is inserted; these two surfaces are kept in contact through combined forces: a mechanical force generated by springs and another hydraulic force generated by the pressure of a fluid and suitably controlled by a pressure regulator (103, 202, 302). The electronic device regulates the pressurization of a mechanical seal to variable pressure values, keeping the optimum difference (305) constant between pressure (303) inside the mechanical seal and pressure (304) in the pump delivery line or inside the process machine in which the seal is installed.



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**A. CLASSIFICATION OF SUBJECT MATTER**  
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Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                          |
|------------|--|--|
| A          | WO 01 40756 A (PECHT GLENN G ;CRANE JOHN INC (US); WILLIAMSON GUY GARDNER (US))<br>7 June 2001 (2001-06-07)<br><br>page 5, line 1 -page 6, line 23<br>page 11, line 21 -page 14, line 24; claims 21-32 | 1-5,11,<br>14,16,<br>17,<br>21-24,<br>27-32    |
| A          | US 4 792 911 A (SNUTTJER OWEN R ET AL)<br>20 December 1988 (1988-12-20)<br><br>the whole document<br><br>-----<br>-/-  | 1-7,10,<br>11,13,<br>16,17,<br>21-33,<br>35,36 |

☒ Further documents are listed in the continuation of box C.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| A          | US 5 762 342 A (KAKABAKER KENNETH G ET AL) 9 June 1998 (1998-06-09)<br>column 2, line 17 - line 57<br>column 6, line 36 - line 61<br>column 7, line 40 - column 9, line 26;<br>figure 3 | 1, 3-5, 31            |
| A          | US 6 116 609 A (AZIBERT HENRI V)<br>12 September 2000 (2000-09-12)<br>column 3, line 2 - line 26<br>column 13, line 25 - line 67  | 1                     |

## INTERNATIONAL SEARCH REPORT

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| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---|---------------------|----------------------------|---------------------|
| WO 0140756                                | A | 07-06-2001          | AU 2254301 A               | 12-06-2001          |
|   |   |                     | EP 1290367 A2              | 12-03-2003          |
|   |   |                     | WO 0140756 A2              | 07-06-2001          |
|   |   |                     | US 2001030396 A1           | 18-10-2001          |
| US 4792911                                | A | 20-12-1988          | CA 1260061 A1              | 26-09-1989          |
|   |   |                     | DE 3765431 D1              | 15-11-1990          |
|   |   |                     | EP 0229719 A2              | 22-07-1987          |
|   |   |                     | IN 167261 A1               | 29-09-1990          |
|   |   |                     | JP 62178135 A              | 05-08-1987          |
|   |   |                     | MX 162342 A                | 26-04-1991          |
|   |   |                     | YU 4687 A1                 | 30-04-1989          |
| US 5762342                                | A | 09-06-1998          | NONE                       |                     |
| US 6116609                                | A | 12-09-2000          | US 6131912 A               | 17-10-2000          |
|   |   |                     | US 6068264 A               | 30-05-2000          |
|   |   |                     | US 6059293 A               | 09-05-2000          |
|   |   |                     | US 6068263 A               | 30-05-2000          |
|   |   |                     | US 6155572 A               | 05-12-2000          |
|   |   |                     | US 6076830 A               | 20-06-2000          |
|   |   |                     | AU 1924299 A               | 05-07-1999          |
|   |   |                     | AU 1925999 A               | 05-07-1999          |
|   |   |                     | AU 1931299 A               | 05-07-1999          |
|   |   |                     | EP 1038130 A1              | 27-09-2000          |
|   |   |                     | EP 1038131 A1              | 27-09-2000          |
|   |   |                     | EP 1042626 A1              | 11-10-2000          |
|   |   |                     | JP 2002508489 T            | 19-03-2002          |
|   |   |                     | JP 2002508490 T            | 19-03-2002          |
|   |   |                     | WO 9931412 A1              | 24-06-1999          |
|   |   |                     | WO 9931413 A1              | 24-06-1999          |
|   |   |                     | WO 9931414 A1              | 24-06-1999          |
|   |   |                     | US 6120034 A               | 19-09-2000          |
|   |   |                     | US 2001010416 A1           | 02-08-2001          |
|   |   |                     | US 6557856 B1              | 06-05-2003          |
|   |   |                     | US 2002096835 A1           | 25-07-2002          |